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# Effect of packing characteristics on the discrete element simulation of elasticity and buckling

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**Abstract**

Discrete Element Method (DEM) simulations are used to model the elastic properties of a continuous material. The preparation route of the particle packing is shown to have a significant effect on the macroscopic properties. We propose simple relations, generalized from the mean field solution, that are able to fit DEM results. These relations introduce only basic microstructural features such as the coordination number and the packing density. When the tangential to normal stiffness ratio increases above unity, the material becomes potentially auxetic. Buckling is also explored with DEM, and results on cylindrical bars are compared to the classic Euler results for critical stress.

*Keywords:* Discrete Element Method; buckling; elasticity

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## 1. Introduction

Originally designed for granular materials [6], the Discrete Element Method (DEM) has been employed in the recent years to model continua. DEM,

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